Emma Lake

LaGrange County

Supplemental Evaluation - 2010

Date of Survey: June 7-8 and August 16, 2010

Biologist: Larry Koza

Objectives: Emma Lake was sampled as part of Division of Fish and Wildlife (DFW) Work Plan 300FW1F10D43642, Glacial Lakes Status and Trends, the objective of which is to develop a quantifiable protocol that describes the status of glacial lake fish communities relevant to their condition and factors that affect that condition. Emma Lake serves as one lake among a sample size of 60 lakes involved in the first five years of this study. Lakes are grouped into one of five clusters based on several variables. Fish habitat and fish community data will be collected from each cluster and a database will be developed to explore relationships between similar lake types. Several general fish community surveys have been conducted at Emma Lake by DFW biologists, the last having taken place in 2006.

Methods: This survey was conducted on June 7 and 8, 2010. Water temperature and dissolved oxygen were measured throughout the water column. Water clarity was also measured along with pH, alkalinity and conductivity. Submersed aquatic vegetation was sampled on August 16, 2010 using methods outlined in the Tier II Aquatic Vegetation Survey Protocol developed by the DFW Lake and River Enhancement Program and used in their aquatic vegetation control grant program. Four zooplankton tows were also conducted on both June 7 and August 16. A global positioning system (GPS) device was used to record the location of the limnological data collection site, aquatic vegetation sample sites, and fish collection sites. Fish were collected by pulsed D.C. electrofishing the shoreline at night with two dippers for 30 minutes. Two trap nets and two experimental-mesh gill nets were also fished overnight for one night. All fish collected were measured to the nearest 0.1 in TL and four weights per tenth inch group were taken to the nearest 0.01 pound. Five scale samples per half-inch group were collected from game species for age and growth analysis.

Summary: The Secchi disk reading in June was 6.0 feet which corresponded to the depth at which dissolved oxygen levels were ample for fish survival (Table 1). Thirty sites were randomly sampled during the plant survey, 20 of which fell within the littoral zone in water 10 feet in depth or less. A total of seven native species were identified. Aquatic plants were observed at all of the littoral sites sampled. The maximum number of plant species found at one site was four and the mean was one. Coontail was the dominant plant collected (60% of the sites) followed by sago pondweed. Flat stem- pondweed and curlyleaf pondweed, an exotic invasive species, tied as the next most common species collected with each being found at 13% of the sites. Three emergent, floating or floating leaf plants associated with wetlands, cattails, spatterdock and white water lily, were also observed.

Zooplankton samples in both June and August were dominated by daphnia (47.5% and 63% respectively). Calanoida copepods were the second most prevalent zooplankton in the June survey (33%) while cyclopodia ranked second in August (26%). Of the remaining species collected, bosminidae represented the greatest presence at 8% in June. Five additional species were collected in small numbers with only one of these being present in both months sampled.

Thirteen species of fish were collected from Emma Lake in 2010, totaling 259 fish (Table 2). Numerically, bluegill was the top species collected (51%), followed by largemouth bass (27%) and white sucker (14%). Largemouth bass was the dominant species collected by weight (29.5%) followed by white sucker (24%) and bowfin (19%). A total of 132 bluegills ranging in length from 2.5 to 9.0 in TL was collected. Harvestable size fish (6 in TL or larger) comprised only 18% of the catch and only 5% measured 7 in TL or larger (Table3). Bluegill electrofishing catch (128/hr) was below average (400/hr). Largemouth bass led the total catch by weight and were second numerically. Seventy bass, the largest measuring 18.1 in TL, were collected during the survey. Approximately 9% of these were legal-size (≥14 in TL). The electrofishing catch rate for bass was 136/hr compared to the average of 100/hr. Bluegills grew at a rate that was average for northern Indiana natural lakes, as did age-3 and older bass. Age-1 and age-2 bass grew at an above average rate. Other major sport fish collected included two black crappies and one northern pike.

Recommendation: Due to the presence of a satisfactory sport fish population, there is no fish management recommended for Emma Lake at this time.

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Approved by: Stu Shipman, North Region Fisheries Supervisor
Date: 2/28/11

Table 1. Dissolved oxygen levels (ppm) and water clarity (secchi depth) at Emma Lake from 1974 through 2010.

Depth (ft)	7/74	7/85	6/90	6/06	6/10
Surface	10.0	8.0	9.2	7.8	8.7
2				7.8	8.4
4				8.0	7.2
5	10.4	7.0	9.4		
6				8.2	3.5
8				5.4	0.5
10	7.8	3.8	8.4	2.9	0.5
12				1.0	0.5
14				0.8	0.5
15	1.2	1.6	4.0		
16				0.8	0.5
20	0.4	0.5	1.6	0.8	0.5
Secchi (ft)	2.5	9.5	5.0	2.5	6.0

Note: Prior to 2006 dissolved oxygen readings were only taken at 5 ft intervals which has since changed to 2 ft intervals.

Table 2. Sampling effort, species composition and relative abundance of fish collected during 1974, 1985, 1990, 2006 and 2010 fisheries surveys of Emma Lake.

Species	1974	1985	1990	2006	2010
Black crappie	15	39	69	11	2
Bluegill	88	368	256	149	132
Bowfin				1	1
Brook silverside				Present	Present
Brown bullhead	1		2	1	1
Channel catfish				1	
Common carp		1	1	6	2
Common shiner	3				
Golden redhorse	36	8	4	2	5
Golden shiner	56	30	9		
Green sunfish	2	2	3		1
Largemouth bass	18	65	50	93	70
Northern pike	1	4	4	1	1
Pumpkinseed	16	29	34	3	
Redfin pickerel	2	1		1	
Spotted gar		1		5	4
Spotted sucker	1		1		
Warmouth	2	9	6	2	
White sucker	51	79	61	48	37
Yellow bullhead	3	30	8	5	3
Yellow perch	3	14	37	1	
Total	298	680	545	330	259
Sampling Effort					
Electrofishing Effort	1.0 h AC	0.75 h DC	0.75 h DC	0.5 h DC	0.5 h DC
Gill Net Effort	6 lifts	4 lifts	6 lifts	4 lifts	2 lifts
Trap Net Effort	0	6 lifts	4 lifts	3 lifts	2 lifts

Table 3. Catch by select size ranges for bluegills and largemouth bass collected during 1974, 1985, 1990, 2006 and 2010 fisheries surveys of Emma Lake.

Species	Length Range (TL)	1974	1985	1990	2006	2010
Bluegill	3.0-5.5 in	39	211	172	76	106
	6.0-6.5 in	35	151	66	6	17
	7.0-7.5 in	13	4	7	16	5
	$\geq$ 8.0 in	1	0	0	9	2
Largemouth bass	8.0-9.5 in	3	12	14	20	17
	10.0-11.5 in	1	14	7	24	26
	12.0-13.5 in	1	3	1	17	9
	14.0-17.5 in	3	7	18	0	5
	$\geq$ 18.0 in	0	0	4	0	1

AGE-LENGTH KEY FOR BLUEGILL														
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
2.5	2	2	2											
3.0	2	1		2										
3.5	10	5		2	8									
4.0	17	6			17									
4.5	28	5			28									
5.0	23	5			23									
5.5	26	6			13	13								
6.0	10	5			10									
6.5	7	5			2	4	1							
7.0	2	2				2								
7.5	3	3					3							
8.0	1	1					1							
9.0	1	1						1						
Total	132	47	2	4	101	19	5	1						
Mean TL			2.7	3.5	5.0	6.1	7.6	9.3						
SE				0.14	0.07	0.13	0.25							

AGE-LENGTH KEY FOR LARGEMOUTH BASS														
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
5.5	1	1	1											
6.0	3	3	3											
6.5	2	2	2											
7.0	4	4	4											
7.5	2	2	2											
8.0	1	1		1										
8.5	5	5		5										
9.0	10	8		10										
9.5	1	1		1										
10.0	3	2			3									
10.5	6	6		1	5									
11.0	8	6			4	4								
11.5	9	6			2	7								
12.0	1	1				1								
12.5	3	3				2	1							
13.0	1	1				1								
13.5	4	4				1	3							
14.0	1	1				1								
14.5	1	1				1								
15.0	1	1					1							
15.5	1	1					1							
17.5	1	1						1						
18.0	1	1						1						
Total	70	62	12	18	14	18	6	2						
Mean TL			6.9	9.2	10.9	12.3	14.2	18.0						
SE			0.19	0.12	0.13	0.25	0.45	0.25						

OCCURRENCE AND ABUNDANCE OF SUBMERSED AQUATIC PLANTS						
Lake: Emma	Total Sites: 30			Mean species/site: 1.37		
County: LaGrange	Sites with plants: 20			SE Mean species/site: 0.24		
Date: 8/16/2010	Sites with native plants: 20			Mean native species/site: 1.13		
Secchi (ft): 6.0	Number of species: 10			SE Mean natives/site: 0.18		
Maximum Plant Depth (ft): 10.0	Number of native species: 7			Species diversity: 0.76		
Trophic Status:	Maximum species/site: 4			Native species diversity: 0.72		
Species	**Frequency of Occurrence**	**Rake score frequency per species 0**	**1**	**3**	**5**	**Plant Dominance**
Coontail	60.0	40.0	30.0	13.3	16.7	30.7
Sago pondweed	26.7	73.3	10.0	16.7	0.0	12.0
Curlyleaf pondweed	13.3	86.7	13.3	0.0	0.0	2.7
Flat-stem pondweed	13.3	86.7	10.0	3.3	0.0	4.0
Elodea	10.0	90.0	6.7	3.3	0.0	3.3
Slender naiad	10.0	90.0	10.0	0.0	0.0	2.0
Chara	6.7	93.3	0.0	0.0	6.7	6.7
Bladderwort	3.3	96.7	3.3	0.0	0.0	0.7

Other species observed: Cattail, Spatterdock, White waterlily.